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# Geography and the Anthropocene II: Current contributions

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# Geography and the Anthropocene II: Current contributions

## **Abstract**

This and two companion papers (The Anthropocene and Geography I: The back story and The Anthropocene and Geography III: Future Directions) consider the relevance of 'the Anthropocene' to present and future research in Geography. Along with the concept of 'planetary boundaries', the idea that humanity has entered a new geological epoch of its own making is currently attracting considerable attention - both within and beyond the world of Earth surface science from whence both notions originate. This paper's predecessor detailed the invention and evolution of the two scientific neologisms, ending with a general discussion of their potential relevance to Geography. The present essay examines how that relevance is being actualised in practice. Though the Anthropocene and planetary boundaries concepts are the progeny of certain biophysical scientists, some human geographers are already going beyond the science to explore their socio-ecological implications. Accordingly, the paper describes how various physical, environmental and human geographers have thus far examined the (supposed) end of the Holocene. By detailing the full range of geographers' discussions of the two ideas, it comprehensively maps intellectual territory that a (so-far select) group of geographers have been exploring independently of each other, albeit layered on previous research into global environmental change. Its successor (The Anthropocene and geography III: Future directions) speculates about the future directions geographers' discussions of the Anthropocene and planetary boundaries might take.

## **Keywords**

ii, anthropocene, geography, contributions, current

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# The Anthropocene and Geography II: Current Contributions

**Abstract** This and two companion papers (Xxxxxxx, 2014a, 2014b) consider the relevance of ‘the Anthropocene’ to present and future research in Geography. Along with the concept of ‘planetary boundaries’, the idea that humanity has entered a new geological epoch of its own making is currently attracting considerable attention – both within and beyond the world of Earth surface science from whence both notions originate. This paper’s predecessor detailed the invention and evolution of the two scientific neologisms, ending with a general discussion of their potential relevance to Geography. The present essay examines how that relevance is being actualised in practice. Though the Anthropocene and planetary boundaries concepts are the progeny of certain biophysical scientists, some human geographers are already going beyond the science to explore their socio-ecological implications. Accordingly, the paper describes how various physical, environmental *and* human geographers have thus far examined the (supposed) end of the Holocene. By detailing the full range of geographers’ discussions of the two ideas, it comprehensively maps intellectual territory that a (so-far select) group geographers have been exploring independently of each other, albeit layered on previous research into global environmental change. Its successor (Xxxxxxx, 2014b) speculates about the future directions geographers’ discussions of the Anthropocene and planetary boundaries might take.

**Keywords** The Anthropocene; planetary boundaries; the Holocene; physical geography; human geography; environmental geography.

## Introduction

Once a vivid neologism coined by two prominent environmental scientists (Crutzen & Stoermer, 2000), ‘the Anthropocene’ is now a buzzword in many parts of academia and has also achieved a degree of visibility outside universities. In recent years, it has been accompanied by the concept of ‘planetary boundaries’ (Rockström *et al.*, 2009). Like the Anthropocene idea, this concept is an invention of several scientists spread across multiple subject areas and emerges out of prior research into global environmental change (including climate change). The two terms are extraordinarily grand. They suggest human influences on the biophysical world of such scale, scope and magnitude as to mark the end of the Holocene epoch. If taken seriously, their normative implications significantly amplify those usually associated with anthropogenic climate change. They invite a far-reaching examination of virtually *every* aspect of 21<sup>st</sup> century life – from commodity production to transportation systems to energy systems to food consumption habits and beyond. This is especially true of the Anthropocene concept because, among other things, it graphically transgresses the ontological distinction that

supposedly exists between humans and those globe-girdling environmental systems that have remained relatively stable for the last 12000 years or so.

In a previous paper the provenance of the Anthropocene and planetary boundaries ideas was described, along with their potential significance for Geography and geographers (Xxxxxxx, 2013a). This potential is just beginning to be realised. This essay introduces readers to the so-far modest number of published attempts by geographers to formally consider the content or implications of the two epochal concepts. Though numerically small, we will see that these attempts already extend beyond the one group we might reasonably expect to pay attention to the duo given their scientific origins – namely, various physical geographers and several human-environment geographers trained in the scientific-analytical tradition.<sup>1</sup> However, as we will also see, these various geographers' contributions have not, thus far, achieved critical mass or led to much mutual exchange or debate.

Given contemporary Geography's (often lamented) internal diversity, this is not entirely surprising. But it does raise questions about the direction future discussions of the Anthropocene and planetary boundaries might take. Because the two ideas speak, in different ways, to *both* physical and human geographers (plus those betwixt them) they might provide a common point of reference in a discipline possessed of unusually high intellectual band-width. They might thereby push geographers beyond current research into 'global environmental change' (including climate change), which has become a key 'boundary concept' since about 1990 by focussing different investigators' attention on a shared subject (albeit often without much dialogue).<sup>2</sup> By mapping-out geographers' varied interventions to-date, we can begin to understand how the potential described at the end of the previous paper might be realised in the years immediately ahead. This paper's successor (Xxxxxxx, 2014b) will consider these future possibilities systematically. The opportunities are rich because, in recent years, Geography has to a certain extent reprised its historic origins as a subject devoted to studying the complex

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<sup>1</sup>By 'scientific-analytical' tradition I mean those environmental geographers accustomed to some combination of quantitative analysis, use of remote sensing, modelling (conceptual and/or computational), hypothesis testing, and the language of 'systems', 'elements', 'variables' and 'drivers'. Though the distinctions are sometimes difficult to draw, such geographers usually research the world in ways somewhat (or very) different from those trained as 'critical' investigators or in a humanistic mode. As always, there are exceptions. For instance, Diana Liverman – who I discuss later in this essay – wears different 'hats' for different audiences when publishing her research and her ideas. Sometimes she appears more as a 'scientists' other times as a 'critic' of science, science policy and current environmental policy. For an autobiography of sorts, see Liverman (1999).

<sup>2</sup>By 'global environmental change' I don't mean to imply all the research is focussed on the global scale. On the contrary, much of it tracks the local or regional causes and effects of such change.

relations between people and their environments. As the comment above about global environmental change research implies, substantial number of investigators thus now exist who are capable of adding their voices to unfolding discussions of what the Holocene's end means for life on Earth.<sup>3</sup>

When read together, this essay and its companion papers should give readers much food for thought about how we geographers, and many others besides, could contribute to potentially momentous discussions of a world to come. Together, the papers detail the 'backstory' to geographers' recent discussions of the Anthropocene and planetary boundaries, the nature of those discussions, and what this tells us about Geography's future contributions to wider considerations of a post-Holocene world. The papers are best seen as three 'chapters' of a very short 'book': they should be read as a trio rather than separately – indeed the third makes little sense without the other two. This said, the first and second instalments will suffice for those who simply want to know where the discussion has led to so far.

### **Physical and human-environment geographers: representations of worldwide biophysical change**

It is no surprise that several physical geographers – or some environmental scientists based in Geography departments (not entirely the same thing) – have been among those shaping initial understandings of the Anthropocene and planetary boundaries. It is no surprise too that they have been joined by some human-environment geographers possessed of a scientific-analytical training (rather than a critical social science or humanities training: see footnote 1). As the previous paper made clear, despite their epochal meanings neither concept is the preserve of geologists. Instead, because they refer to historically recent and current human impacts on the non-human world, both ideas are closely associated with the full spectrum of Earth surface sciences – including all the branches that together comprise contemporary physical geography, also reaching into parts of 'environmental geography' too. Since the early 1990s, many of these sciences' practitioners have been brought into closer engagement courtesy of the global environmental change research programmes set-up around the time of the first Earth Summit. Indeed, Paul Crutzen – one of the inventors of the Anthropocene idea – was for a time vice-

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<sup>3</sup>Some of these geographers have for many years been interested in tracking anthropogenic climate change and wider processes of global environmental change. Indeed, they have arguably been a central part of the wider scientific networks responsible for bringing both to the attention of politicians, publics and business people worldwide. One example is Billie Lee Turner II, whose academic work and advocacy has done much to bring 'the human impact' on the Earth to high level attention in the USA and beyond.

chairman of the International Geosphere-Biosphere Program (IGBP).<sup>4</sup> He used the networks created by the Program to enrol others (e.g. leading Australia-based climate scientist Will Steffen) in the testing and development of his and Eugene Stoermer's Anthropocene epochal claim (see, for instance, Crutzen and Steffen, 2003). This kind of networking and collaboration has also received a consistent boost from numerous well-funded national-level research programmes into environmental change (terrestrial, marine and/or atmospheric).

So, what specific contributions have been made by physical geographers, and some human-environment geographers, to the evolution of the Anthropocene and planetary boundaries concepts? As we will now see, a small number of researchers have been co-authors of some of the foundational publications discussed in the previous paper. Others, more recently, have been part of wider attempts to resolve the data issues that arise in determining how one measures the purported end of the Holocene.

#### *Proposers and assessors*

Four 'proposers' stand-out, that is to say a quartet of geographers who have lent their names to either the Anthropocene hypothesis and/or the planetary boundaries idea. They are: Erle Ellis, based at University of Maryland, Baltimore County (UMBC); Diana Liverman, based at the University of Arizona (but affiliated with Oxford University too); Eric Lambin, based at the University of Louvain (and also Stanford University, in the USA); and Tim Lenton, an Earth system scientist at Exeter University, England. Though they usually write with other authors separately, on one recent occasion all but Lenton have written with others together (see DeFries *et al.*, 2012). These 'others' include the prominent scientists Crutzen and Steffen, and geologist Jan Zalasiewicz (who has done much to popularise the Anthropocene hypothesis among his disciplinary peer group).

Ellis is a biogeographer deeply interested in so-called 'anthromes' (anthropogenic biomes) and the various 'novel ecosystems' that both deliberate and unintentional human activity has created over recent centuries. Along with other ecologists, he has repeatedly challenged the idea that 'natural biomes' are only nowadays under severe threat. For him, these biomes have been rare for a great many decades, such is the temporal depth of the human imprint on the terrestrial landscape. Furthermore, Ellis has

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<sup>4</sup>The British physical geographer Frank Oldfield was a Program 'insider', and is now chief editor of the new interdisciplinary peer review journal *The Anthropocene Review*. However, to-date he has not been a formal advocate for either the Anthropocene or planetary boundaries concepts, and so I do not focus on his writings in this paper.

challenged ecologists to stop using ‘nature’ as a benchmark for determining the ‘fit and proper’ state of terrestrial ecology. Instead, he maintains, we can have a biodiverse world if we continue to actively *shape* ecosystems rather than somehow try to give natural biomes a chance to re-emerge by significantly reducing human ‘interference’ (see, for example, Ellis [2013]). This chimes with Emma Marris’s (2013) charter for a ‘post-natural’ paradigm in environmental management.

To-date Ellis has contributed to scientific discussions of both the Anthropocene and planetary boundaries ideas. With respect to the former he authored a paper on anthromes that was published in a special issue of the *Philosophical Transactions of the Royal Society* (Ellis, 2011). The issue was devoted to exploring whether and how the Holocene could be said to have ended. Ellis’ article offered a synthesis of existing biogeographical evidence and was hedged with the usual scientific caveats. Even so, it concluded that there is *prima facie* case that ‘natural’ Holocene ecosystems are a thing of the past. Echoing this, but ranging more widely, Ellis then joined Crutzen, Steffen and others in rebutting the suggestion – made by two geologists (Autin & Holbrook, 2012) – that the Anthropocene idea has little scientific validity (see Zalasiewicz *et al.* 2012). With these authors Ellis argued that evidence can, in time, tell us whether the idea has utility as a means of describing recent – versus distant – environmental change.

These two contributions focus on issues of scientific measurement and comparative magnitudes of biophysical change over time. However – and again, writing with others – Ellis has recently offered a view on how the end of the Holocene stands to affect the relationship between environmental scientists, governments and the wider society (DeFries *et al.*, 2012). Here, in an implicit endorsement and extension of the planetary boundaries concept, Ellis has talked about ‘planetary opportunities’ for humanity looking ahead. These are opportunities to make geographically specific and suitable adaptations to future environmental change, choosing from a suite of technological options and a menu of underpinning social values. Ellis and his co-authors call upon all researchers interested in Earth surface dynamics to focus on ‘solutions oriented’ inquiry designed to avoid harmful environmental change while addressing diverse human goals (for an earlier version of this argument see Ellis & Haff, 2009). The new ‘social contract’ for scientists like them should, in their view, move beyond the mere provision of information to non-academic stakeholders. Instead, Earth and environmental science should be more

engaged and practically orientated, framed as much by societal needs as scientific norms.<sup>5</sup>

Diana Liverman and Eric Lambin were, with Ellis, both co-authors of the just mentioned 2012 paper (which was published in the respected journal *Bioscience*).<sup>6</sup> Liverman has a very broad geographical training and has long combined expertise in Earth surface science (specifically land cover change) with expertise in how humans both alter, and respond to, their biophysical environment. Her writings have long evidenced a close attention to the socio-spatially uneven impacts of environmental change and the need to build justice-considerations into adaptive responses. In recent years she has joined other environmental scientists more than once in urging governments to take scientific insights about impending Earth surface changes more seriously (see, for example, New *et al.*, 2009). Lambin, also an environmental geographer, focuses on land cover change in rural areas, possesses expertise in remote sensing and geographical information science and combines different kinds of data in order to paint a fuller picture of reality. He has tried to identify the key local and global drivers of different kinds of alterations of territory (especially forest and agriculture), but has also written semi-popular works about humanity's current 'environmental predicament' (Lambin, 2007; 2012). Both he and Liverman are highly esteemed in the wider multi-disciplinary networks of contemporary environmental science. Though neither has formally proposed the Anthropocene concept (notwithstanding their personal connections to Crutzen and Steffen<sup>7</sup>), both were among the twenty nine authors of the paper in *Ecology & Society* that first presented the planetary boundaries concept in some detail (Rockström *et al.*, 2009a) – and concurrently summarised it in the world-leading science periodical *Nature* (Rockström *et al.* 2009b). Lambin also joined others in presenting the concept

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<sup>5</sup>I should also add that Erle Ellis has tried to communicate his ideas about the political and practical implications of the Anthropocene to various sections of the public. In this respect he has contributed to the non-academic visibility of the idea summarised in this paper's predecessor. Specifically, he has discussed the idea in *The Economist* magazine, *Time* magazine, *Wired* magazine, the *New York Times*, and *New Scientist* magazine. See the following for samples of Ellis's attempt to popularise Anthropocenic science and its societal implications:

[http://www.nytimes.com/2013/09/14/opinion/overpopulation-is-not-the-problem.html?\\_r=0](http://www.nytimes.com/2013/09/14/opinion/overpopulation-is-not-the-problem.html?_r=0);

<http://www.wired.com/wiredscience/2009/05/ftf-ellis-1/>

<http://www.snap.is/magazine/embracing-our-history-as-transformers-of-earth/>; and

<http://www.newscientist.com/article/mg21729070.200-time-to-forget-global-tipping-points.html#.UoqlZXZFDIU>

<sup>6</sup>Prior to this they attended a Tällberg Foundation funded event in Sweden focussed on the subject of planetary boundaries.

<sup>7</sup>I say this because both have, on various occasions, co-authored papers, chapters or books with these two individuals. See, for instance, Steffen & Lambin (2006).

to readers of *Scientific American* (Foley *et al.*, 2010). Diana Liverman has, in addition, used her human geography training to participate in the so-called Earth System Governance Project (ESGP), a global 10 year attempt by social scientists to assess the governance rules and institutions needed to ensure joined-up international responses to uneven patterns of future worldwide environmental change (e.g. see Biermann *et al.* 2010).

Finally, Tim Lenton is, unlike the other three, an out-and-out physical geographer interested in measuring and modelling flows and fluxes among large-scale Earth surface sub-systems, especially (but not only) those pertaining to climate. Trained as a natural scientist at Cambridge University and inspired by James Lovelock's Gaia hypothesis, he was one of the co-authors of the two just mentioned papers that first advanced the planetary boundaries idea. Among other things, Lenton has tried to clarify the idea of environmental tipping points. He has also, like Liverman, sought to take environmental science to policy makers rather than wait for them to notice its key messages (see, for instance, Lenton, 2011).

In contrast to these four proponents of the idea that Earth may be crossing an epochal threshold, other geographers have assumed a more neutral role. First, Phil Gibbard – a distinguished Cambridge geographer specialising in Quaternary science – has co-authored papers with various earth scientists, laying-out the criteria (and related evidential requirements) to determine if the Anthropocene can be said, in a *geological* sense, to have begun (see Zalasiewicz *et al.* 2008, 2011). He has performed this role by virtue of his membership of the Stratigraphy Commission of The Geological Society (located in London). As detailed in Xxxxxxx (2014a), the Commission initiated a debate in Geology about whether humans were now creating a worldwide environmental signal sufficient for future stratigraphers to detect a phase-shift in Earth history.

Relatedly, several other physical geographers have recently used their expertise to address the Commission's call for determining possible stratigraphic markers of the Holocene's (possible) end. Though not themselves geologists, their research is germane to stratigraphic questions because current (or recent) environmental change might, in future, become geologically significant. There are three recent publications to consider. First, members of the British Geomorphological Society's Fixed Term Working Group on the Anthropocene have mapped-out the geomorphological markers that might, in time, offer enduring stratigraphic evidence of the Anthropocene (Brown *et al.*, 2013). The Group's work is ongoing. Second, two Geography-based soil scientists have doubted whether anthropogenic soil profiles can (yet) serve as

robust stratigraphic indicators (Gale & Hoare, 2012). Finally, two British fluvial geomorphologists doubt whether landform chronology can ever produce an agreed start date for the Holocene's end (Lewin & Macklin, 2013).

### *Summary*

This small band of physical and environmental geographers has played a role in either proposing or assessing the ideas of the Anthropocene and/or planetary boundaries. That role has so far been modest in two senses. First, Ellis, Liverman, Lambin and Lenton are just four of the many 'proposers' discussed in the previous paper and have not, for good reason, attempted to stand-out from their various non-Geography co-authors. Second, the 'assessors' have thus far published little and have mostly confined their comments to strictly scientific questions. I offer both observations in an entirely non-judgemental way. It is not at all unusual for physical and environmental geographers to write and publish in large teams. What is more, many 'physical geographers' do not think of themselves as Geographers but as, for example, Quaternary scientists or coastal geomorphologists first-and-foremost. Lenton is a good example, having migrated into a Geography department where he continues the sort of science he practised previously in a different disciplinary and institutional setting. Similarly, some environmental geographers define their research in topical terms (e.g. adaptation to climate change) rather than disciplinary terms.

In sum, and as we have seen, the various geographers mentioned above have been part of a thoroughly *collective, cross-disciplinary* discussion across the earth (sub)surface sciences which is still gathering momentum – though which could, in future, also rather plateau if too many scientists find the measurement or modelling issues to be intractable.<sup>8</sup> In this context, disciplinary identities seem not to matter much. Instead, it is the ideas that are to the fore, rather than the provenance of those proposing and assessing them. In the case of the geographers considered above, these ideas have (understandably) been explored in a scientific (or science-related) sense for the most part – meaning that their implications for society have largely been left to other analysts within and outside Geography to explore. It is to the writings of some of these others that we now turn.

## **Human geographers, the Anthropocene and planetary boundaries**

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<sup>8</sup>When I say plateau, I do not mean interest in measuring and suggesting responses to humanly-induced Earth surface change will entirely diminish. I simply mean that attempts to pin-point the Holocene's end and quantify planetary boundaries may fall into abeyance, even as academic concern about 'the human impact' increases.

In recent years many human geographers have sought to bring questions of nature and environment into their 'side' of what, a generation ago, appeared to be a discipline of two halves with a vanishing centre. This provides the intellectual context for their recent engagements with the Anthropocene hypothesis.

Simplifying somewhat, this 'rediscovery' of the biophysical by human geographers has taken four forms (which, in practice, overlap). First, from the mid-1980s 'political ecology' emerged, which focussed on the socio-economic and political relations that structure how ordinary land users make decisions about managing natural resources. This research fed-into a revived 'agrarian geography' that looked at the institutional and regulatory configuration of new 'agro-food systems' organised at the global scale through complex commodity-chains. Second, not long after this, a strand of research into 'discourses and representations of nature' emerged that regarded words and images of everything from trees to human genes to polar bears as media through which both social power and social resistance are exercised. As part of this, a few human geographers began (and have continued) to look closely at the discourses and images produced by scientists, and at the ways these were/are utilised in the wider society. Third, once anthropogenic climate change became a live issue in science and politics, many human geographers began to focus on questions of human adaptation to, and mitigation of, this change. For instance, much effort was (and still is) expended studying 'social resilience' to a more volatile or extreme climate.

This third strand of research has, with some exceptions, been closest in spirit to the sort of 'environmental geography' represented by Liverman and Lambin.<sup>9</sup> This kind of geographical research has, especially in North America, often paid close attention to regional and larger-scale human alterations of land and water, as much as climate. At times, it also has overt political elements to it, as in ongoing research into how 'sustainability transitions' might be achieved in capitalist societies or inquiries into why the poor always suffer most when a 'natural disaster' occurs. Finally, and more recently, many younger human geographers have focussed on the hitherto ignored materials and life-forms that contemporary Westerners are inextricably tied to. Some of this research has emerged from a revived 'animal geography' (once known as 'zoogeography') that scrutinises the varied roles 'companion species' (e.g.

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<sup>9</sup>Environmental geography is a term now commonly used for what was once (for some still is) called 'man-land' geography (in the US especially), 'human-nature' geography or 'society-environment' geography. In North America especially, the above mentioned political ecology is strong but also jostles with a more scientific-analytical approach focussing on the largest scale of human transformations of the Earth.

dogs, rats, bees or butterflies) play in reproducing our daily lives. It explicitly questions the self-sufficiency of the 'human' in human geography and is part of a 'rematerialisation' of the field and a reconsideration of what constitutes 'the social'. This questioning and reconsideration echo important developments in various humanities and social science fields, from science and technology studies (STS) to feminist philosophy.

As will we now discover, a number of human geographers involved in some of these research strands have recently fixated on the Anthropocene concept, though with the planetary boundaries as yet little discussed because of its novelty.<sup>10</sup> As will also become clear, they are far less interested in exploring the scientific questions that have largely preoccupied their physical counterparts and the wider Earth science community. Instead, they have accepted the 'game-changing' implications of the Holocene's proclaimed termination.<sup>11</sup>

### *New ontologies and new 'performative' discourses?*

Some human geographers regard the Anthropocene as grounds for a fundamental rethink of the most elemental categories of Western thought – with all this implies for how we might then act in the world. In Geography, these categories have helped to organise the discipline's contents and practitioners for decades. Axiomatic dualisms like nature-culture, society-environment, and rural-urban have underpinned internal divisions of academic labour between various 'human' and 'physical' geographers. More broadly, they are also seen by some to have created a false sense of separation between people and the non-human world, as if what we by convention call 'nature' were a stable backdrop or mere *tabula rasa* for our desires.

This attention to the Anthropocene's ontological implications has been most evident in the recent writings of Nigel Clark (e.g. 2010, 2011) and Kathryn Yusoff (e.g. 2013a), both non-Geographers by training who are now based in different British university Geography departments (though once colleagues at

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<sup>10</sup>As I did in the previous sub-section, I will only focus on those published contributions where the Anthropocene is explicitly discussed. I realise this creates a rather artificial distinction between an author's current and previous writings. For instance, someone's earlier publications on anthropogenic climate change might be germane to their most recent writings on the Anthropocene. However, note that I have made an effort to consider the publication history of each author whose recent writings I now discuss. This will, I hope, add necessary context to my presentation of each author's ideas. Furthermore, in this paper's successor I attend more closely to the longer history of research by geographers about global environmental change.

<sup>11</sup>This acceptance continues a habit already evident in the few published social science and humanities reflections on the Anthropocene to-date authored by the likes of STS scholar Bruno Latour and historian Dipesh Chakrabarty.

Lancaster University). In different ways, they explore what the epic ontological mixings inadvertently created by human actions mean for life on Earth. As they rightly insist, the Anthropocene points us way beyond intentional efforts to remake the non-human, such as animal breeding, genetic modification or synthetic biology. It involves taking a dead geological past – in the form of stored subterranean energy (e.g. coal) – and, through its use as fuel and other petrochemical products, creating a new and largely uncontrollable Earth future. For Clark and Yusoff, the Anthropocene forces upon those of us who had forgotten it the recognition that we are thoroughly *earthly* creatures, not simply fleshy, biological ones: we are simultaneously emergent from, dependent upon and at times vulnerable to a plethora of living and non-living phenomena. Their hope is that the Anthropocene's onset can engender a new sensibility in Geography and the wider world, one more attuned to both the 'more-than-human' (e.g. plants or insects) *and* the 'inhuman' (i.e. those biophysical forces capable of destroying us and utterly indifferent to our existence).

I say 'sensibility' because both authors remain largely philosophical in their arguments, thus far avoiding discussion of how, precisely, we should live in the Anthropocene. They call for academic 'worldviews' and modes of existence that are attuned to the enormous tangle of biophysical relationships that have sustained – and threatened – various forms of human existence since *homo sapiens* first made their historic appearance. For both authors, a proper recognition that we are both children of the Earth and yet now a planetary force in our own right might engender a new sensitivity and a new humility. Yusoff (2009, 2013a, 2013b) has written much about the former, arguing for a less certain and less 'muscular' response to global environmental change than one finds in everything from 'carbon trading' schemes to proposals to geoengineer the skies and oceans. For her we need a more open and generous sense of the world around us. In the West, at least, this involves unlearning existing 'Cartesian' habits of thought and action. Clark (2011, 2012) echoes this argument, but is more highly attuned to the Earth's destructive forces. He expresses hope that, if the Anthropocenic future is a volatile one, it can produce a new ethic of shared concern among humans and a greater awareness of the limits to human agency. Together, Yusoff and Clark both extend and challenge existing human geographic research into the 'more than human'. They call for an expanded sense of the non-human (in scope and scale) and a sober recognition of human fragility. They thus differ from both the hyper-modernisers who would seek to ramp-up human efforts to manage and control the biophysical environment, and those who predict future ecological

chaos and attendant international conflict. Though neither group is especially evident in contemporary Geography, both certainly exist outside it.

Like Yusoff and Clark, Irish-Canadian political geographer Simon Dalby has written about the Anthropocene's implications of late. Like them, he seems to take the claims made by Crutzen, Steffen and others less as scientifically undecided ones than as virtual matters of fact. But he focuses more on how societal actors outside Geography might *use* the science – or what they might propose in the name of it. In this sense, he regards the ontological implications of the Anthropocene for any society as being up-for-grabs epistemologically. Dalby has long been a leader in the 'critical geopolitics' movement within both political geography and the field of international relations. This movement examines the conceptions of domestic and overseas territories that animate inter-state relations and strategies. It regards these conceptions as contestable social fabrications rather than geographical verities – even if many elite political actors and ordinary citizens regard them as the latter. If the Anthropocene idea catches-on in the world of national and international politics, Dalby (2013) rightly argues that critical scrutiny of the resulting geopolitical discourses – which may be rather novel ones – is important. However, like Yusoff and Clark, he calls upon human geographers to invent a new repertoire of ideas, ones that might help humans produce a future world where inter-state cooperation and peace largely characterise the response to Anthropocenic change (Dalby 2010: 285-6). For him, critical geopolitics post-Holocene needs to complement *critique* with 'dirty hands' *engagement*, all underpinned by a recognition of the serious messages issuing from the environmental sciences (Brauch, Dalby & Oswald-Spring, 2011). He terms this hoped-for new approach 'political geoecology' (*ibid.* 1453).

*New socio-ecological futures between hyper-modernisation and catastrophe, centre and margin?*

Let us turn now to writings that share Clark and Yusoff's belief that the Anthropocene's (putative) onset necessitates new sensibilities, and Dalby's insistence that human geographers should be in the serious business of suggesting achievable socio-ecological alternatives. The difference, as we will now see, is that they focus on *concrete* instances of alternatives and – in one case – urge us to look *beyond* the centres of power (e.g. national governments) when contemplating the sources of societal change. In other words, they eschew Clark and Yusoff's largely philosophical musings and – again in one case – believe that 'engaged inquiry' and 'actionable knowledge' for a better future will emerge as much from the social margins as by seeking to alter mainstream

values and habits. Yet they downplay the future existential threats to humanity a changed Earth might present.

Oxford University geographer Jamie Lorimer has, for several years, been inspired by a paradigm change in conservation biology and practice that has, to some degree, affected the sub-field of biogeography. As we saw when discussing Erle Ellis's work, many nature conservationists now accept that 'natural biomes' are a myth, which means that even 'nature reserves' must be seen as *emergent* products of both human agency and non-human 'wildness'. Looking ahead, this frees-up nature conservation to occur in more places and in a wider variety of ways than heretofore – all because a stable Nature does not exist as a general benchmark against which everything from brownfield ecology to farmed landscapes are judged pejoratively as 'artificial'. This may sound like a back-door means of justifying the continued destruction of Holocene ecosystems, but Lorimer – like Ellis (whose work Lorimer seems not to have noticed!) – is more sanguine. In recent research, he has examined an unusual Dutch nature reserve called Oostvaardersplassen (OVP) which has involved the deliberate 'recreation' of an early Holocene ecosystem just inland of the North Sea. Far from being a return to a pre-human 'nature', Lorimer (writing with philosopher Clemens Driessen) highlights the hybrid character of this 'wild experiment' in which even the conservation 'experts' are charting new territory without the security of cognitive maps:

... OVP is a nature reserve for the Anthropocene in the sense that it is willingly presented as a made site for knowing and experimenting with an uncertain future. It is uninhabited and uncultivated, but it is not purified. It is hybrid, in the sense that it is a knowing co-production of multispecies agencies. It serves as the inspiration and catalyst for the proactive 'development' of 'new natures' ... (Lorimer & Driessen, 2013: 10).

For Lorimer, the Anthropocene invites a set of continuous, locally specific 'experiments' with biogeography where we cannot entirely control the variables and should be open to surprise – rather than seek to impose order (see also Lorimer, 2012). The 'we' legitimately extends beyond trained scientists because 'lay experts' can offer useful insights given the uncertainties and possibilities involved. Lorimer's wider message is that 'environmentalism' today should fixate neither on a lost (or soon-to-be 'vengeful') Nature or fool itself that intensified techno-managerialism is a feasible way forward.

Like Lorimer, the well-known writing duo Julie Graham (now sadly deceased) and Kathy Gibson are keen to disclose alternatives to the political-economic order that has unwittingly altered the Holocene's boundary conditions. As with all the human geographers mentioned so far, they regard

the Anthropocene proposition as entirely plausible and are keen to explore its implications for humanity. But they have come late to the global environmental change issue, and – by their own admission – the proposition belatedly jolted them into recognition (see Gibson-Graham, 2011). They have since tried to integrate this issue into their long-standing, multi-sited and influential inquiries into so-called ‘alternative economic geographies’ (for a ‘pre-Anthropocene’ summary see Gibson-Graham, 2008). These inquiries focus on innovative local alternatives some people have created to the rules, relations and institutions associated with capitalism, patriarchy, and other seemingly dominant orders of social reality. For Gibson-Graham, the advent of the Anthropocene can inspire an extension of these inquiries that might identify – and seek to co-create – situations where people display a real openness to the world, that is “... a living process of inter-being” or, put differently, “... a process of co-constitution that produces a new body world” (Gibson-Graham, 2009: 322).

Romantic, even fanciful, as this may sound to some, their fieldwork sites in the US and Australia show that communities exist – even in the highly technologised West – that are trying to ‘live with’ non-human others in the experimental ways recommended by Lorimer. Gibson-Graham’s own immersion in so-called ‘hybrid research collectives’ – where academics and ordinary people become collaborators – also shows that human geographers can be active participants in unlocking the potential for new socio-ecological alternatives beyond the mainstream. In sum, where Dalby urges (some) human geographers to fashion new ideas that might alter the behaviour of key societal actors (like nation states), Gibson-Graham urges active involvement with those already creating different modes of living. This is consistent with their belief that the more one highlights actually-existing alternatives to (e.g.) capitalism, the more one realises that the mainstream is not as unchangeable as it may seem.

#### *A new dispensation for biophysical science?*

As we have seen, all the human geographers so far mentioned have taken the claims of Crutzen, Steffen and other environmental scientists as direct predicates of their own arguments. However, in a recent paper on the Anthropocene in the journal *Cultural Geographies*, the American geographers Paul Robbins and Sarah Moore (2013) make the science the centre-piece of a constructively critical intervention. Like Lorimer, they are drawn to conservation biology – Erle Ellis’s bailiwick (but again in apparent ignorance of Ellis’s ‘post-natural’ arguments or his membership of the Crutzen, Steffen,

Rockstrom networks).<sup>12</sup> But where Lorimer (like Ellis) regards it as an exemplary Anthropocenic science happy to ‘invent’ as much as ‘discover’, Robbins and Moore argue that old scientific habits remain unhelpfully persistent. For them, these habits pivot on the venerable distinction between ‘facts’ and ‘values’, a dualism that has long both secured and threatened the public reputation of the sciences.

In the case of conservation biology and its affiliates (namely, restoration and invasion biology), it arose in conditions of perceived worldwide biodiversity loss through both land (and marine) degradation *in situ* and the movement of ‘invasive species’ from *ex situ* locations (facilitated by people). Its reputation partly rested on classic scientific grounds: its practitioners devoted themselves to revealing the ‘hard evidence’ of species loss and ecosystem erasure. On this basis many designed environmental management programs that were supposedly value-free because they took ‘natural biomes’ as their normative benchmark. However, aside from Ellis, several other ecologists have of late questioned the demonization of invasives and the presumption that a ‘natural’ ecology can be reliably identified in any given part of the inhabited world. Robbins and Moore examine the ensuing stand-off between these questioners and those still dedicated to protecting ‘native’ and natural biomes. In a recent *Nature* article, the questioners argued that the latter had, for years, illicitly allowed value judgements to colour their supposedly scientific lens on the world (Davis *et al.*, 2011). An example is the concept of ‘invasion’ which, Davis *et al.* argue, is a deeply colonial, anthropocentric metaphor inappropriate when describing species that do not share our capacity to care about which other species they must jostle with. In response, their critics complained that this undermines conservation science’s role in highlighting how human activities are directly, and indirectly, causing ‘the sixth extinction’ of life on Earth (see Simberloff *et al.* 2011).

Robbins and Moore regard these positions of ‘autophobia’ and ‘anthrophobia’ as symptomatic of ‘ecological anxiety disorder’ – that is, fear as a displacement of the anxiety scientists feel when the separation between ‘facts’ and ‘values’, ‘objectivity’ and ‘subjectivity’ seems threatened. However, for them the anxiety is *constitutive* of science and should not be evaded in the search for ‘pure’ positions within or outside the scientific enterprise. Turning their attention to ‘rewilding’ experiments in the Indian Ocean that echo the Oostvaarderplassen one, Robbins and More urge environmental scientists – and all of us who rely on them – to embrace the unavoidable *melange* of value

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<sup>12</sup>This is a little surprising in Robbins’ case, since both he and Ellis have written for the American liberal-left think-tank The Breakthrough Institute.

judgements, informed guesses, openness to contingency and systematic observation that Anthropocenic science involves. This is not a charter for 'relativism' (as if any scientist can and should see what they want to see!). Instead, it calls us all to rethink what environmental science could and might contribute to life on Earth when the needs and wants of both humans and non-humans are so thoroughly entangled. This is consonant with Lorimer's approval of 'wild experiments' in which trained scientists, non-scientists, and non-human species are all active, and only loosely scripted, players. But whether and how *all* the relevant Anthropocenic environmental sciences can overcome the 'disorder' Robbins and Moore diagnose is an open question. For instance, the planetary boundaries idea suggests that there are 'natural limits' that certain scientists anxiously want societies to take very seriously indeed.

### *Summary*

The writings I just summarised have all been published in relative isolation from each other (Clark's and Yusoff's are the exception). As we have seen, they have diverse topical foci and make a range of claims about the Anthropocene. Parsing these, key axes of difference are (i) how radical socio-economic change should or could be from hereonin; (ii) whether to focus on changing mainstream society or to build-out from the social margins; and (iii) what kind of Anthropocenic science can best serve society.

Yet despite their differences the authors have six things in common. First, virtually all of them accept the scientific claims about the Anthropocene as a precondition of their own arguments. Second, all draw large normative conclusions from the science, be they philosophical or practical, and be they applicable to society at large, to human geographers more specifically, or (in two cases) to environmental scientists. Among these conclusions is a belief that terms like 'nature' and 'human' have lost (or should lose) their former (or enduring) normative force. Third, despite their normative arguments, few of the authors have presented substantive charters for political-economic or cultural change. Nothing so 'muscular' as a 'programme' yet characterises their writings. Fourth, all inhabit the centre-left of the political spectrum, mixing a concern for inclusive human well-being and more participatory decision-making with a recognition that at least some of the Earth's other inhabitants deserve – even demand – a new degree of attentiveness. In various ways they call for fresh beginnings that break with existing paradigms. Fifth, all tend to write alone or with one other author, pitching their arguments largely to a

readership of Anglophone human geographers.<sup>13</sup> This contrast with the sort of collective writing common in physical geography and the wider Earth and environmental sciences. Finally, none formally engage with those directly responsible for creating and propagating the ideas of the Anthropocene and planetary boundaries. Even Lorimer, Robbins and Moore – who actively discuss scientific practice in conservation biology – do not consider most of the published science summarised in this essay's predecessor (Xxxxxxx, 2014a). In this respect they mirror the likes of Ellis, Lambin, Liverman, and Lenton who – as we discovered earlier – have so far seemingly made little of Geography's wider intellectual resources in advancing their particular Anthropocenic propositions.

What these various elements of difference and commonality in the literature signify, for good or ill, depends entirely on one's perspective on the sort of analytical and normative demands the idea of the Holocene places on researchers, teachers and a plethora of non-academic constituencies. I will consider some of these perspectives as they pertain to Geography in the next and final paper in this three-part survey.

Looking ahead, recent sessions on the Anthropocene at the 2013 American and British geography conferences suggest that the human geographers discussed above are now beginning to debate and share ideas more than before. They are also drawing younger human geographers into the discussion, as a forthcoming 'forum' on the Anthropocene attests (Johnson & Morehouse, 2014). An intellectual head-of-steam may now be building that eclipses the current level of interest in the Holocene's end evident in physical geography. Will it have any bearing on how physical geographers (and other environmental scientists) approach the subject in the future?

## **Conclusion**

This paper has sought to map a so-far small, recently emergent intellectual landscape in which a diverse set of geographers have trained their sights on a common concern, namely the Anthropocene (and, to a much lesser extent, planetary boundaries). It is 'new' in the sense that the Holocene's proclaimed end was not taken seriously until recently, even though the rather less dramatic idea of anthropogenic environmental change at the global-scale certainly was. As we have discovered, these geographers have explored different parts of the metaphorical territory and have rarely crossed paths. Arguably, their early journeys across the Anthropocene's discursive terrain

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<sup>13</sup>I say this based on the choice of journals these authors have published their 'Anthropocenic' arguments. Paul Robbins and Nigel Clark are the major exception here, with Yusoff sometimes publishing (alone or with others) outside journals whose readership is largely Anglophone human geographers.

simply reflect the many intellectual starting points a discipline as (unusually) diverse as Geography offers. In this paper's successor essay – the last instalment in the trio – we consider what might lie ahead.

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